

Taxonomic re-evaluation of *Schoenoplectiella lateriflora* subsp. *laevinux* (Cyperaceae) and a new record for *Schoenoplectiella erecta* subsp. *erecta*

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Summary. Micro-morphological examination of nutlets show that *Schoenoplectiella lateriflora* subsp. *laevinux* (Cyperaceae), recorded from Tanzania, is synonymous with *Schoenoplectiella erecta* subsp. *erecta*, thus extending the range of this species. Examination of herbarium specimens also shows this species to be present in Zambia.

Key Words. Nutlets, SEM, Tanzania, taxonomy, Zambia.

Introduction

Schoenoplectus section *Supini* was created by Raynal (1976) to encompass annual species of *Schoenoplectus* exhibiting amphicarp. These species were then transferred to *Schoenoplectiella* Lye (Lye 2003). *Schoenoplectiella* species, most of which are African, have previously been distinguished on quantitative characters, few of which, unless considered collectively and selectively, are of taxonomic value. Two closely affiliated taxa with distributions extending to other continents are *Schoenoplectiella erecta* (Poir.) Lye and *Schoenoplectiella lateriflora* (J. F. Gmel.) Lye. Separation of these two species is based mainly on the number of style branches and nutlet conformation. Subspecies have also been recognised in recent accounts of both of these species. The typical subspecies of *S. erecta* has two style branches and faint transverse waves on the nutlet which scarcely extend over its angles giving the nutlet an almost smooth appearance. Its counterpart in *S. lateriflora* has three style branches and a markedly rugose trigonous nutlet (Table 1).

Schoenoplectus lateriflorus subsp. *laevinux* Lye was based on a single collection (Wingfield 2036) from just north of Dar es Saalam, Tanzania (Lye 1983). Lye separated it on the basis of its two style branches and flattened slightly transversely wrinkled nutlet. Conversely, pencil annotations on the label indicated that it was a 'form' of *Schoenoplectus erectus* on the basis of the nutlet sculpturing.

In Africa, *Schoenoplectiella erecta* subsp. *erecta* occurs only in the north and west of the continent, but during examination of Kew collections, the second author identified two sheets (*Robinson* 5448) collected in Zambia purporting to be *S. erecta* subsp. *erecta*. The first sheet was a mixed collection with two plants sharing the label *Scirpus lateriflorus* Gmel., (*S. lateriflora* (J. F. Gmel.) Lye) identified by Schuyler in 1972, and the third plant, also identified by Schuyler, as *Scirpus uninodis* (Del.)

Coss. & Dur. (*S. erecta* subsp. *erecta*). The second sheet had all its plants determined as *Schoenoplectus erectus*.

In this paper we: 1) re-assess the taxonomic status of *Schoenoplectus lateriflora* subsp. *laevinux* from Tanzania and 2) establish the presence of *S. erecta* subsp. *erecta* in Zambia.

Materials and methods

To confirm the identity of *Robinson* 5448 as that of *Schoenoplectiella erecta* subsp. *erecta*, mature nutlets were first observed using a light microscope and images were taken using a digital camera placed against the eyepiece. Comparisons were made with accurately named specimens of the same taxon.

For scanning electron microscopy (SEM) observation, nutlets were directly mounted onto aluminium stubs and sputter coated with platinum for 1 minute. Observations were conducted using an electron microscope with a voltage of 2 kV.

In re-evaluating *Schoenoplectiella lateriflora* subsp. *laevinux*, nutlets from the isotype at K were examined under SEM and compared with those from *Robinson* 5448.

Results and Discussion

There are few collections at K of *Schoenoplectiella erecta* subsp. *erecta* from Sub-Saharan Africa. Morphometric analysis cannot be reliably carried out until more collections come to light. Of the collections from Senegal, Mali and N Nigeria cited by Hooper (1972), all had two style branches and aerial nutlets, but only *de Wailly* 5006, a collection from Mali, had a mature aerial and basal nutlet. Nutlet size of *Robinson* 5448 (1.4×1.25 mm) and *de Wailly* 5006 (1.5×1.25 mm) agreed closely, while sculpturing indicated little difference (Fig. 1A – C). The basal nutlet of *de Wailly* 5006, including the beak, was 2.1 mm long.

Table 1. Morphological comparison of key characters in the subspecies of *Schoenoplectiella erecta* and *S. lateriflora*.

character	<i>S. erecta</i> subsp. <i>erecta</i>	<i>S. erecta</i> subsp. <i>raynalii</i>	<i>S. lateriflora</i> subsp. <i>lateriflora</i>	<i>S. lateriflora</i> subsp. <i>laevinux</i>
stigma branches	2	2	3	2
nutlet ornamentation	undulate	rugose	rugose	undulate
nutlet shape	biconvex	biconvex	trigonus	biconvex

When comparing these dimensions to those of Wingfield 2036, there was also agreement although Lye (1983) gave measurements slightly smaller, namely 1.3 × 1.1 – 1.2 mm, for the aerial nutlet. Lye also noted that the subspecies differed from *Schoenoplectiella erecta* subsp. *erecta* by having only 2 mm long basal nutlets and shorter glumes. It is our opinion that neither of these statements is sufficient to warrant it subspecies level and combined with aerial nutlet similarity and the presence of two style branches, *S. lateriflora* subsp. *laevinux* should be placed in synonymy under *S. erecta* subsp. *erecta*.

Robinson 5448 is also the first and, at present, only record of *Schoenoplectiella erecta* subsp. *erecta* from Zambia. The collection was from an area where rice is an important cash crop so it is possible that this sedge was brought in with rice seeds.

This account extends the known African distribution of *Schoenoplectiella erecta* subsp. *erecta* from Madagascar and associated islands, North & West Africa to Tanzania and Zambia. It is also possible that it has been introduced into several other African countries. The taxon is also present in Australia where it is noted as an introduction.

Key to the subspecies of *Schoenoplectiella erecta* & *S. lateriflora* in Africa

1. Style 2-branched, nutlet biconvex or plano-convex. 2
- 1.' Style 3-branched, nutlet trigonous or weakly so. ***S. lateriflora***
2. Nutlet smooth to slightly wrinkled. ***S. erecta* subsp. *erecta***
- 2.' Nutlet distinctly rugose. ***S. erecta* subsp. *raynalii***

Taxonomic treatment

Schoenoplectiella erecta (Poir.) Lye (2003: 25); Beentje (2010: 34). Type: Mauritius, *du Petit Thouars* 13 (holotype P).

Annual, or short-lived tufted *perennial*, 5 – 30 cm (including inflorescence bract). *Leaves* absent, or less often present, basal sheaths ending in short subulate lobe; may enclose basal 3-styled female florets, developing basal nutlets $\pm 2.2 \times 1.4$ mm long and wide, sometimes with 2 bristles. *Inflorescence* pseudolateral, overtopped by lower bract, upper bract absent or present, short. *Spikelets* clustered, subsessile or stalked; reddish-brown to cream, ovoid, 3 – 18 × 2 – 3 mm. *Glumes* (2.5) 3 – 4 mm long, triangular, lanceolate, glabrous, margin ciliate or not, mucronate. *Perianth bristles* absent. *Stamens* 3, *style* 2-branched. *Aerial nutlet*; dark brown to black, lenticular, ovoid, 1.4 – 1.6 × 1.1 – 1.4 mm, smooth to faintly rugose or distinctly rugose.

Schoenoplectiella erecta* subsp. *erecta

Schoenoplectiella lateriflora subsp. *laevinux* Lye (1983: 242),

synon. nov. Type: Tanzania, 28 km straight NNW of Dar es Salaam, 200 m S of Log Cabins, sea level, 15 July 1972, R. Wingfield 2036 (holotype DSM; isotypes EA, K!). (Fig. 2)

DISTRIBUTION. South-Western Europe: Western Portugal & South-West Spain, Africa: Algeria, Egypt, Libya, Mali, Niger, Nigeria, Senegal, Tanzania, Zambia & Zanzibar. Madagascar & Mauritius. India, Vietnam. Possibly introduced in Australia.

SPECIMENS EXAMINED. **SENEGAL.** 1958, *Naegelé* s.n. (K!). **MALI.** Bordue de Marigot, 29 March 1936, *de Wailly* 5006 (K!). **NIGER.** Lac Tchad, delta de la rivière Yobè, 19 Feb. 1968, *J. Léonard* 4536 (K!). **NIGERIA.** Bornu Province, Chad Distr., 22 March 1963, *Jackson* 2574 (K!). **TANZANIA.** 28 km straight NNW of Dar es Salaam, 220 m S of Log Cabins, 15 July 1972, R. Wingfield 2036 (K!). **ZAMBIA.** Kalabo, 2 Aug. 1962, *Robinson* 5448 (K!).

HABITAT. Growing in swampy ground along the edges of water bodies; alt. 1000 – 1100 m.

CONSERVATION STATUS. Least Concern (LC) due to its wide distribution.

NOTES. This species is distinguished from *Schoenoplectiella erecta* subsp. *raynalii* by its smooth to scarcely wrinkled nutlet. The degree of rugosity may be more pronounced in specimens examined from Madagascar and Mauritius and a full global treatment of the two subspecies may be required to establish the delimitation of this character.

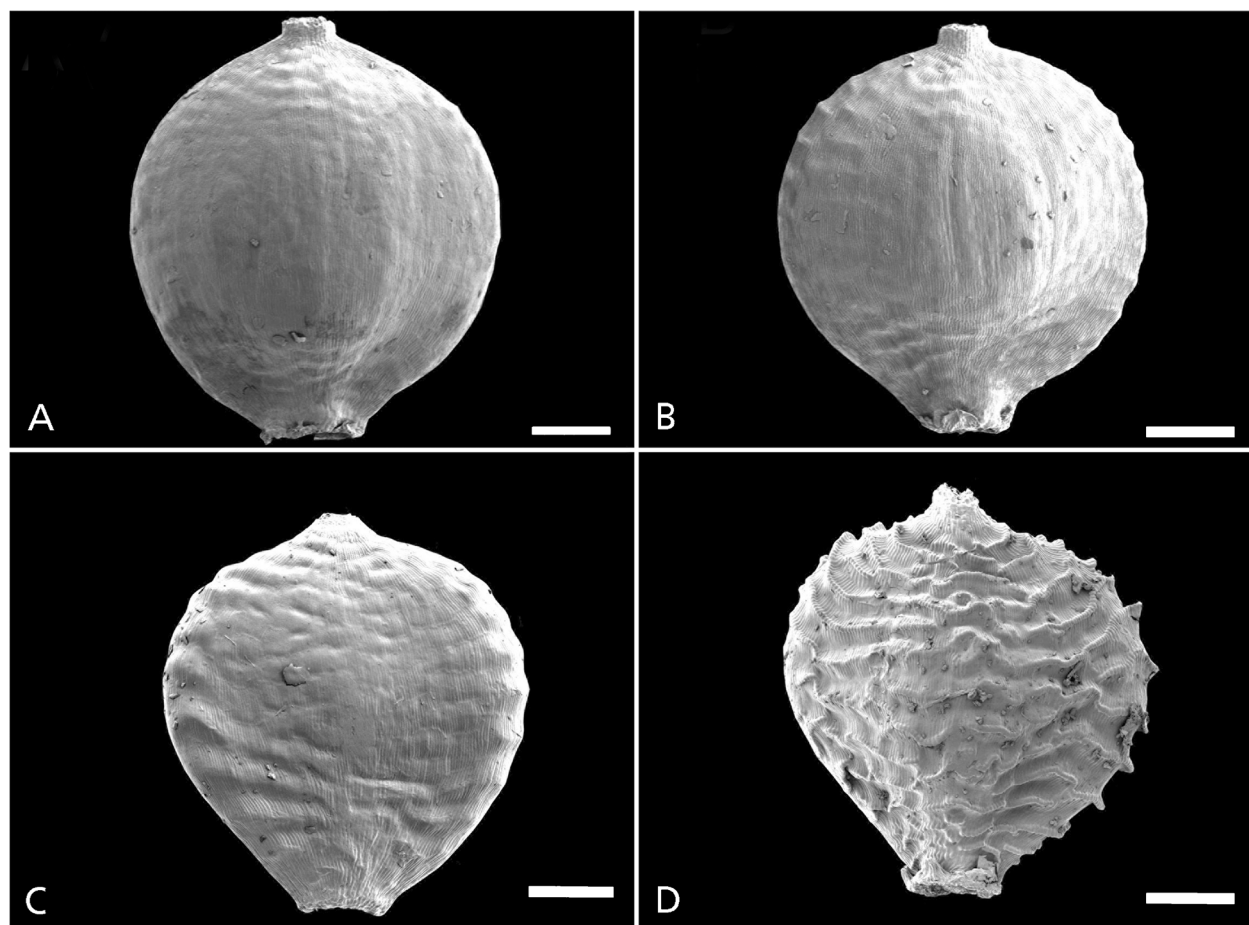


Fig. 1. Scanning Electron micrographs of nutlets. A – C *Schoenoplectiella erecta* subsp. *erecta*; D *Schoenoplectiella erecta* subsp. *raynalii*. A de Wailly 5006 (Mali); B Robinson 5448 (Zambia); C Wingfield 2036 (Tanzania); D M. G. Bingham & M. A. Vestergaard 13096 (Zambia). Scale bars = 250 µm.

Schoenoplectiella erecta* subsp. *raynalii (Schuyler) Beentje (2010: 34). Type: Botswana, 23 km on Maun-Shorob road, Yalala 425 (holotype P; isotype K).

DISTRIBUTION. Africa: Botswana, Namibia, South Africa (KwaZulu-Natal, Limpopo, North West and Northern Cape), Tanzania, Uganda, Zambia & Zimbabwe. SE U.S.A. to Mexico. South America: Argentina & Paraguay.

SPECIMENS EXAMINED. BOTSWANA. Toromoja, Botletle R., 22 April 1975, J. F. Ngoni 424 (K!); S of Toromoja School on bank of Botletle R., 22 April 1971, G. Pope 360 (K!); Northern Division, Toten, 18 March 1965, H. Wild & R. B. Drummond 7146 (K!); Selinda Spillway 23 km S of the Tsetse Fly Control Road, 18°44.779'S, 23°06.260'E, alt. 969 m, 25 Nov. 2004, Alison & Roger Heath 703 (K!); ± 1 km W of Chief's Camp, Chief's Island, Okavango Delta, 19°18.371'S, 22°54.221'E, alt. 960 m, 3 Sept. 2009, Alison & Roger Heath 1700 (K!); within 8 km S of Motswiri Camp, 18°46.529'S, 23°02.399'E, 27 Nov. 2004, Alison & Roger

Heath 722 (K!); ±2 km SW of Chief's Camp, Chief's Island, Okavango Delta, 19°18.583'S, 22°54.171'E, alt. 975 m, 12 Nov. 2011, Alison & Roger Heath 2166 (K!).

MOZAMBIQUE. Magaia, 18 Jan. 1898, s. coll.12054 (K!).

TANZANIA. 6 km NW of Dar es Salaam, Bagamoyo road, just beyond Village Museum, on left, 31 July 1971, R. Wingfield 1744 (K!); Mchungu Forest, Utete Distr., Coast Region 7°40'S, 39°17'E, 27 Aug. 1990, *Frontier-Tanzania Coastal Forest Research Programme* 1391 (K!); Dar es Salaam, 3 June 1966, R. W. Haines 4146 (K!); Dar es Salaam, 3 Sept. 1926, A. Peter 44876 (K!). **UGANDA.** Mengo Distr., Kirindi, Dec. 1935, Chandler 1480 (K!). **ZAMBIA.** Sesheke Distr., NE corner of Sioma Ngwezi National Park, 9 Aug. 2006, M. G. Bingham & M. A. Vestergaard 13096 (K!).

HABITAT. River banks & margins and edges of wetlands; alt. 900 – 1100 m.

CONSERVATION STATUS. Least Concern (LC) due to its extent of distribution.

NOTES. This subspecies differs from the typical subspecies in its markedly rugose nutlet (Fig. 1D). As



Fig. 2. Isotype of *Schoenoplectiella lateriflora* subsp. *laevinux* Lye.

explained in the notes above, some intergradation in this character may occur between the two subspecies.

Schoenoplectiella lateriflora (*J. F. Gmel.*) *Lye* (2003: 25); Beentje (2010: 35). Type: Sri Lanka, *König* s.n. (holotype LD).

Annual, tufted. *Culms*, few to many closely packed, 5 – 50 cm long (including overtopping erect, inflorescence bract), 0.4 – 1.8 mm wide, ridged, triangular to almost terete. *Leaves* sheaths 1 – 2 cm long, often lowest enclosing basal female floret, style 3-branched, 15 – 20 mm long, basal nutlet wrinkled, 2 – 2.5 × 1.4 – 2 mm, blades absent or if present up to 30 cm long, flat or folded. *Inflorescence* consisting of clusters of spikelets, appearing pseudolateral, overtopped by inflorescence bract, shorter than culm. *Spikelets* 1 – 20, sessile or shortly pedunculate, 4 – 10 × 2 – 2.5 mm, ovoid, acute. *Glumes* 2 – 3 mm long, ovate to broadly boat-shaped, pale brown with reddish streaks, green midrib, mucronate, margin ciliate apically. *Perianth* absent. *Stamens* 3. *Style* 3-branched. *Aerial nutlet*, broadly ovoid, trigonous or weakly so, turning black at maturity, 1.1 – 1.4 × 0.8 – 1.3 mm, surface markedly rugose.

DISTRIBUTION. Throughout the Old World Tropics. Africa: Angola, Botswana, Central African Republic, Equatorial Guinea, Ethiopia, Ghana, Kenya, Mali, Malawi, Mozambique, Namibia, Nigeria, Senegal, Somalia, Tanzania & Uganda. Eastern Asia to Indo-China, Malay Islands, Philippines & Northern Australia.

SPECIMENS EXAMINED. **BOTSWANA.** Unnamed pan alongside Khurunxaraga/Xigera Road at 19°46.7'S, 23°05.7'E, 23 Jan. 1977, *P. A. Smith* 1894 (K!). **GHANA.** Busunu; Damongo to Yapei, 10 Sept. 1965, *J. B. Hall* 880 (K!); just beyond Leotonou on E side Dahomey, 25 March 1952, *J. K. Morton* 6676 (K!). **MALI.** Sotuba, 10 Feb. 1960, *J. & A. Raynal* 5489 (K!); Dogo, Old Farm Land, 2 May 1952, *J. T. Davey* 111 (K!). **NIGERIA.** Lagos; in muddy marsh, Ikoyi Plains, 18 Nov. 1917, *J. M. Dalziel* 1307 (K!). **SENEGAL.** Mbao, Jan. 1951, *Berhaut* 1327 (K!); Kaide, 3 Dec. 1898, *A. Chevalier* 2447 (K!). **TANZANIA.** Mikumi National Park, 8½ km WSW of main gate, alt. 530 m, 28 Jun. 1977, *R. Wingfield* 3957 (K!); Tanga Distr., Kange, 14 Aug. 1958, *H. G. Faulkner* 2176B (K!). **MOZAMBIQUE.** Gaza, cidade de Xai-Xai.

Pequena lagoa no centro da cidade, 7 Oct. 1978, *Jan de Koning* 7261 (K!). **ZAMBIA.** Kabulamwanda, 75 m N of Choma, alt. 3300 ft, 21 April 1955, *E. A. Robinson* 1248 (K!); Kasama Distr., 96 km E of Kasama, 6 May 1962, *E. A. Robinson* 5153 (K!). **ZIMBABWE.** P.E. Dam, Salisbury, 4800 ft, 19 Oct. 1956, *E. A. Robinson* 1814 (K!); Nuanetsi Distr., Malangwe R., South West Matake hills, 7 May 1958, *R. B. Drummond* 5678 (K!).

HABITAT. Water holes, swamps, lake & lagoon margins; alt. 0 – 1300 m.

CONSERVATION STATUS. Least Concern (LC) due to its extensive distribution.

NOTES. The species is usually distinguished from both subspecies of *Schoenoplectiella erecta* by a combination of three style branches and a trigonous nutlet. The surface of the nutlet is otherwise the same as that of *S. erecta* subsp. *raynalii*.

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